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10/815,357

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James Wilson Rose

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GENERAL ELECTRIC COMPANY
GLOBAL RESEARCH
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EXAMINER

LEE, SHUN K

ART UNIT

PAPER NUMBER

2884

| SHORTENED STATUTORY PERIOD OF RESPONSE | MAIL DATE | DELIVERY MODE |
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3 MONTHS

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary

Application No.

10/815,357

Applicant(s)

ROSE ET AL.

Examiner

Shun Lee

Art Unit

2884

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 6/30/06, 10/19/06, & 1/31/07.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-5,7-16 and 18-25 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-5,7-16 and 18-25 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 31 March 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Objections

1. Claims 1 and 13 are objected to because of the following informalities:
 - (a) in claim 1, "media and" on line 11 should probably be --media via said modulator and-- (since essential structural cooperative relationships of elements should be positively recited; see Fig. 2);
 - (b) in claim 13, "optical signals" on line 6 should probably be --said modulated optical signals--; and
 - (c) in claim 13, "the optical signals" on line 7 should probably be --said modulated optical signals--.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.
3. Claims 19-25 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Applicant has not pointed out where amended independent claim 19 is supported, nor does there appear to be a written description of the claim limitation "the second end is coupled to the optical detector via the modulator" in the application as filed.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

5. Claims 1-3, 12-14, and 18 are rejected under 35 U.S.C. 102(a) as being anticipated by Ruzga (US 6,710,350).

In regard to claim 1, Ruzga discloses (Figs. 1-6) a radiation imaging system (10) such as a computer tomography (CT) system (10) for generating an image of an object (18), the imaging system (10) comprising:

- (a) an X-ray source (12) disposed in a spatial relationship to the object (18) configured to transmit X-ray radiation (14) through the object (18);
- (b) at least one X-ray detecting media (22) configured to convert the X-ray radiation (14) transmitted through the object (18) to optical signals;
- (c) a modulator (52, 78) configured for modulating the optical signals;
- (d) an optical transmission conduit (66, 90) comprising a first end and a second end;
and
- (e) an optical detector (67) configured to convert optical signals to corresponding electrical signals; and

wherein the first end of the optical transmission conduit (66, 90) is coupled to the at least one X-ray detecting media (22) and the second end is coupled to the optical detector (67).

In regard to claim 2 which is dependent on claim 1, Ruzga also discloses (Figs. 1-6) an image processor (36, 38, 40) coupled to the optical detector (67) and configured for processing the electrical signals to generate the image.

In regard to claim 3 which is dependent on claim 2, Ruzga also discloses (Figs. 1-6) that the at least one X-ray detecting media (22) comprises a plurality of scintillators.

In regard to claim 12 which is dependent on claim 1, Ruzga also discloses (Figs. 1-6) an optical coupling mechanism (62, 86) configured to enhance a coupling efficiency and for directing the optical signals through the optical transmission conduit (66, 90).

In regard to claims 13 and 14, Ruzga discloses (Figs. 1-6) an method for generating an image of an object, the method comprising:

- (a) transmitting X-ray radiation (14) through the object (18) at a predetermined location;
- (b) converting the X-ray radiation (14) transmitted through the object (18) to optical signals (by using at least one X-ray detecting media 22);
- (c) modulating the optical signals (by using modulator 52, 78);
- (d) providing an optical transmission (conduit or) path (66, 90) for optical signals to an optical detector (67);
- (e) converting the optical signals to corresponding electrical signals (by using the optical detector 67); and

(f) processing the electrical signals to generate the image (by using image processor 36, 38, 40).

Applicant is advised that should claim 13 be found allowable, claim 14 will be objected to under 37 CFR 1.75 as being a substantial duplicate thereof. When two claims in an application are duplicates or else are so close in content that they both cover the same thing, despite a slight difference in wording, it is proper after allowing one claim to object to the other as being a substantial duplicate of the allowed claim. See MPEP § 706.03(k).

In regard to claim **18** which is dependent on claim 13, Ruzga also discloses (Figs. 1-6) directing the optical signals (by using optical coupling mechanism 62, 86) through the optical transmission path (66, 90).

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to

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consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

8. Claims 7-9, 19-21, 23, and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ruzga (US 6,710,350) in view of Gross *et al.* (US 6,310,352).

In regard to claims **7-9** which are dependent on claim 1, the system of Ruzga lacks that the modulator comprises an optical amplifier configured to change an amplification factor of the optical signals and operated in a continuous wave mode or a pulse-sampling mode. Gross *et al.* teach (column 3, lines 10-56) to provide an optical amplifier, in order to transmitted the optical signal over long distances. Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention to provide an optical amplifier pumped by either a CW or pulsed laser in the system of Ruzga, in order to transmitted the optical signal over long distances.

In regard to claim **19**, Ruzga is applied as in claim 1 above. The system of Ruzga lacks that the second end is coupled to the optical detector via the modulator. Gross *et al.* teach (column 3, lines 10-56) to provide an optical amplifier, in order to amplify the optical signal. Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention to couple to the optical detector via a modulator in the system of Ruzga, in order to amplify the optical signal so as to improve the signal to noise ratio.

In regard to claim **20** which is dependent on claim 19, Ruzga also discloses (Figs. 1-6) that the X-ray source (12) and the at least one X-ray detecting media (22)

are disposed on a gantry assembly (24) of the CT system (10), wherein the gantry assembly (24) is configured to rotate about the object (18) being imaged.

In regard to and claim **21** which is dependent on claim 20, Ruzga also discloses (Figs. 1-6) an optical coupling mechanism (62, 86) configured to couple the optical signals generated by the X-ray detecting media (22) disposed on the gantry assembly (24) to the optical detector (67).

In regard to claim **23** which is dependent on claim 19, Ruzga is applied as in claim 2 above.

In regard to claim **24** which is dependent on claim 19, Ruzga is applied as in claim 4 above.

9. Claims 10 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ruzga (US 6,710,350) in view of Applicant's Admitted Prior Art.

In regard to claims **10** and **11** which are dependent on claim 1, the system of Ruzga lacks that the modulator comprises an optically addressed spatial light modulator which includes: a photoconductive layer configured to alter conductivity in response to a reception of light from the plurality of scintillators; a light-modulation layer configured to alter a polarization, phase or intensity factor in response to the change in conductivity of the photoconductive layer; and a sensing device configured to read the altered light-modulation layer and generate a corresponding optical signal. However, Ruzga also discloses (column 6, lines 19-56) that the modulator can comprise of optical gating elements or other types of optical switching devices. Since Ruzga does not disclose and/or require a specific modulator, one having ordinary skill in the art at the time of the

invention would reasonably interpret the unspecified modulator of Ruzga as any one of the known conventional modulator that would not require further description. Further, applicant admits (paragraph 31) it is well known in the art that an optically addressed spatial light modulator includes: a photoconductive layer configured to alter conductivity in response to a reception of light from the plurality of scintillators; a light-modulation layer configured to alter a polarization, phase or intensity factor in response to the change in conductivity of the photoconductive layer; and a sensing device configured to read the altered light-modulation layer and generate a corresponding optical signal. Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention to provide a known conventional modulator (e.g., an optically addressed spatial light modulator when it is desirable that the modulator be optically controlled instead of being electrically controlled) for the unspecified modulator in the system of Ruzga.

10. Claims 1-5, 7-9, 13-16, 19-21, and 23-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Karellas (US 5,465,284) in view of Gross *et al.* (US 6,310,352).

In regard to claims 1 and 7-9, Karellas discloses (Figs. 1-6) a radiation imaging system such as a computer tomography (CT) system for generating an image of an object (16), the imaging system comprising:

- (a) an X-ray source (12, 40) disposed in a spatial relationship to the object (16) configured to transmit X-ray radiation (14) through the object (16);
- (b) at least one X-ray detecting media (20, 48) configured to convert the X-ray radiation (14) transmitted through the object (16) to optical signals;

(c) an optical transmission conduit (26, 44) comprising a first end and a second end;
and

(d) an optical detector (24) configured to convert optical signals to corresponding electrical signals; and

wherein the first end of the optical transmission conduit (26, 44) is coupled to the X-ray detection device (20, 48) and the second end is coupled to the optical detector (24).

In regard to claim 2 which is dependent on claim 1, Karellas also discloses (Figs. 1-6) an image processor (32, 34) coupled to the optical detector (24) and configured for processing the electrical signals to generate the image.

In regard to claim 3 which is dependent on claim 2, Karellas also discloses (Figs. 1-6) that the X-ray detecting media (20, 48) comprises a plurality of scintillators.

In regard to claim 4 which is dependent on claim 3, Karellas also discloses (Figs. 1-6) that the optical transmission conduit (26, 44) comprises a plurality of guided optics.

In regard to claim 5 which is dependent on claim 4, Karellas also discloses (Figs. 1-6) that each one of said plurality of optical optics (26, 44) is coupled to a corresponding one of the plurality of scintillators (20, 48).

In regard to claims 13 and 14, Karellas discloses (Figs. 1-6) an method for generating an image of an object, the method comprising:

(a) transmitting X-ray radiation (14) through the object (16) at a predetermined location;

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- (b) converting the X-ray radiation (14) transmitted through the object (16) to optical signals (by using at least one X-ray detecting media 20, 48);
- (c) providing an optical transmission (conduit or) path (26, 44) for optical signals to an optical detector (24);
- (d) converting the optical signals to corresponding electrical signals (by using the optical detector 24); and
- (e) processing the electrical signals to generate the image (by using an image processor 32, 34).

The method of Karellas lacks modulating the optical signals. Gross *et al.* teach (column 3, lines 10-56) to provide an optical amplifier, in order to transmitted the optical signal over long distances. Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention to modulate the optical signals using an optical amplifier pumped by either a CW or pulsed laser in the method of Karellas, in order to transmitted the optical signal over long distances.

Applicant is advised that should claim 13 be found allowable, claim 14 will be objected to under 37 CFR 1.75 as being a substantial duplicate thereof. When two claims in an application are duplicates or else are so close in content that they both cover the same thing, despite a slight difference in wording, it is proper after allowing one claim to object to the other as being a substantial duplicate of the allowed claim. See MPEP § 706.03(k).

In regard to claim **15** which is dependent on claim 14, Karellas also discloses (Figs. 1-6) that the step of providing the optical transmission path (26, 44) comprises using a plurality of optical fibers and optical waveguides.

In regard to claim **16** which is dependent on claim 14, Karellas also discloses (Figs. 1-6) that the optical transmission path comprises a plurality of free-space optics (*e.g.*, lens 22 and/or mirror 52).

In regard to claim **19**, Karellas is applied as in claim 1 above. The system of Karellas lacks that the second end is coupled to the optical detector via the modulator. Gross *et al.* teach (column 3; lines 10-56) to provide an optical amplifier, in order to amplify the optical signal. Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention to couple to the optical detector via a modulator in the system of Karellas, in order to amplify the optical signal so as to improve the signal to noise ratio.

In regard to claim **20** which is dependent on claim 19, Karellas also discloses (Figs. 1-6) that the X-ray source (12, 40) and the at least one X-ray detecting media (20, 48) are disposed on a gantry assembly (*i.e.*, a means to rotate the source and detector assembly relative to the object; column 16, lines 38-44) of the CT system, wherein the gantry assembly is configured to rotate about the object (16) being imaged.

In regard to and claim **21** which is dependent on claim 20, Karellas also discloses (Figs. 1-6) an optical coupling mechanism (22, 52) configured to couple the optical signals generated by the X-ray detecting media (20, 48) disposed on the gantry assembly to the optical detector (24).

In regard to claim **23** which is dependent on claim 19, Karellas is applied as in claim 2 above.

In regard to claim **24** which is dependent on claim 19, Karellas is applied as in claim 4 above.

In regard to claim **25** which is dependent on claim 19, Karellas is applied as in claim 16 above.

11. Claim 22 is rejected under 35 U.S.C. 103(a) as being unpatentable over Karellas (US 5,465,284) in view of Gross *et al.* (US 6,310,352) as applied to claim 21 above, and further in view of Pandelisev (US 2002/0117625).

In regard to claim **22** which is dependent on claim 21, the modified system of Karellas lacks that the optical coupling mechanism comprises a micro-lens array. However, lenses are well known in the art. For example, Pandelisev teaches (paragraphs 4 and 5) that microlenses may be used to direct the emission from scintillators to detectors. Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention to provide a known lens (e.g., a micro-lens array) in the modified system of Karellas, in order to direct the emission from scintillators to detectors.

Response to Arguments

12. Applicant's arguments filed 30 June 2006 have been fully considered but they are not persuasive.

Applicant argues (fourth paragraph on pg. 7 to fourth paragraph on pg. 8 of remarks filed 30 June 2006) that neither the steerable mirrors nor the gating elements

are configured to modify the optical signals but instead provide a means for directing the signals. In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (*i.e.*, a particular form of modulation such as described in the specification) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). Moreover, both the steerable mirrors (*e.g.*, 52 in Fig. 2) and the gating elements (*e.g.*, 78 in Fig. 5) modulate (*i.e.*, change the amplitude) of the optical signals emitted by the scintillator (22 in Figs. 2 and 5) wherein the modulated optical signal is detected by an optical detector (*e.g.*, 67 in Fig. 3). It is significant that in at least one of the embodiments of Ruzga, the modulator (*e.g.*, gating elements 78 in Fig. 5) does not change the propagation direction of the optical signals but rather only change the amplitude of the optical signals.

Applicant's arguments (last paragraph on pg. 8 to first paragraph on pg. 9 of remarks filed 30 June 2006) with respect to amended claims have been considered but are moot in view of the new ground(s) of rejection.

Applicant argues (second and third paragraphs on pg. 9 of remarks filed 30 June 2006) that the amplifier of Gross cannot be compared to a modulator as discussed in claim 1. Examiner respectfully disagrees. Amplifier of Gross modulate (*i.e.*, change the amplitude) of optical signals. Therefore, the amplifier of Gross is within the scope of the modulator as recited in independent claim 1.

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In response to applicant's argument (last three paragraphs on pg. 9 of remarks filed 30 June 2006) that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, there is some teaching, suggestion, or motivation to do so found in the references themselves. Gross *et al.* teach (column 3, lines 10-56) to provide an optical amplifier, in order to amplify the optical signal. Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention to couple to the optical detector via a modulator in the system of Karellas, in order to amplify the optical signal so as to improve the signal to noise ratio.

Applicant argues (first paragraphs on pg. 10 of remarks filed 30 June 2006) that the dependent claims are allowable since the independent claims are allowable. Examiner respectfully disagrees for the reasons discussed above.

Conclusion

13. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

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A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.


14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shun Lee whose telephone number is (571) 272-2439. The examiner can normally be reached on Monday-Thursday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Porta can be reached on (571) 272-2444. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

SL


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